REMARKS

This responds to the Office Action mailed on May 27, 2005.

Claim 14 is amended, no claims are canceled, and no claims are added; as a result, claims 1-23 remain pending in this application.

§112 Rejection of the Claims

Claims 14-23 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The Applicant respectfully traverses this rejection.

The Office Action states that in claim 14 it is not clear where the patterning of the sensor element occurs. The Applicant respectfully submits that the exact positioning of the sensor 30 is not crucial to the functionality of the claimed invention, as long as the sensor element is "[l]ocated near the resonator 20" so that the sensor can determine the temperature of the resonator. *See e.g.,* ¶ 10 of application. However, to advance the prosecution of the application, the Applicant has amended claim 14 to recite that the sensor element is patterned "proximate to said photonic resonator." The Applicant respectfully submits that this amendment overcomes the rejection under 35 U.S.C. § 112, and that the rejection should be withdrawn. The Applicant further respectfully submits that this amendment is made to more particularly point out and distinctly claim the process of claim 14, and is not made to alter the scope of coverage of claim 14 or any claims depending thereon.

§102 Rejection of the Claims

Claims 1-3, 6-8, 10-11 and 13 were rejected under 35 U.S.C. § 102(b) for anticipation by Huber (U.S. 5,159,601). The Applicant respectfully traverses this rejection.

The present application, in an embodiment, discloses and claims a photonic frequency selection circuit. The circuit has a substrate 25, a resonator 20, heating element 35, temperature sensor 30, processor 40, and current source 45. (¶ 10) The tuning of the temperature of the

resonator 20 via the temperature sensor 30 and the heating element 35 changes the refractive index of the resonator 20, which thereby changes the frequency selected by the circuit. (See application ¶ 15) A precise listing of temperatures and frequencies are loaded into a logic device, and by selecting a temperature/frequency combination from the logic device, the frequency selected by the photonic circuit can be precisely selected. (See application ¶16)

Huber discloses a tunable laser. The laser comprises in part a pump 10, a dichroic mirror 14, an optical fiber 16, and a mirror provided by a grating 18. The grating 18 is connected to a substrate 22 which has a heating element 24 and a thermistor 26. The period of the grating 18 determines the wavelength of light reflected within the laser. By physically stretching or contracting the substrate 22 to which the grating is attached, the period of the grating 18 is changed, thereby changing the wavelength of the light reflected within the laser. (See col. 2, lines 43-64).

The Office Action states that Huber discloses a resonator in the form of a grating 18. The Applicant respectfully traverses this contention. The grating 18 in Huber is a mirror that depends on physical alteration of the period of the grating to determine the wavelength of light that is reflected by the laser. By contrast, the resonator recited in claim 1 of the present application has its refractive index altered by changes in temperature (or its refractive index is maintained constant by maintaining its temperature), thereby changing the frequency selected by the circuit. Since claim 1 recites a resonator, and Huber does not disclose a resonator, claim 1 is not anticipated by Huber, and the Applicant earnestly solicits the allowance of claim 1. The Applicant also solicits the allowance of claims 2-6, which depend on claim 1. The Applicant further solicits the allowance of independent claim 7, which recites a resonator, and claims 8-13 which depend on claim 7 and also include the recitation of a resonator.

Furthermore, claims 1 and 7 recite that a temperature/frequency pair is retrieved from a logic device, and the temperature of the resonator is adjusted to that temperature in order to precisely control the frequency selected by the photonic circuit. Huber refers to a laser, not a photonic switch, and hence does not disclose the precise control of the present invention, but is only concerned with maintaining the wavelength within a laser's gain bandwidth. See Huber col. 1, lines 40-45. Moreover, Huber does not disclose either a processor or a memory such as disclosed and claimed by the present invention for the precise control of selected frequencies.

In rejecting claim 13, the Office Action states that it is inherent in the operation of the circuit disclosed by Huber that a wavelength for the resonator corresponds to a respective temperature, with a list of temperatures and wavelengths constituting a lookup table. The Applicant respectfully traverses this contention. Huber does not even disclose a processor or a memory. A table of temperatures and wavelengths therefore cannot be inherent. The Applicant respectfully submits that the Office Action is improperly using the Applicant's disclosure against the Applicant, and requests that this rejection be withdrawn.

Lastly, the Office Action states that "in order for the system [of Huber] to associate a measured temperature with a desired temperature (which would cause the laser to emit the desired wavelength), it is inherent that some kind of logic is used (e.g., in the simplest form whether a measured temperature is equal or not equal to a set temperature)." Under the doctrine of inherency, the prior art must necessarily function in accordance with, or include, the claimed limitations. *Telemac v. Topp Telecom,* 247 F.3d 1316, 1327-28 (Fed. Cir. 2001). However, the Office Action tacitly admits that Huber does not necessarily include all the limitations of claim 1. Claim 1 recites "logic associating one or more ***frequencies of light*** to ***one or more temperatures*** of said resonator." *(Emphasis added).* In contrast, the "simplest form" of logic put forth as an example by the Office Action does not include a logical handling of light frequencies, but only a comparison to determine if a measured temperature is equal to a set temperature. Therefore, as illustrated by the Office Action's own example, even if Huber disclosed the simplest form of logic in the Office Action example, Huber would not, and does not, necessarily include the claim limitations of claim 1, and therefore does not anticipate claim 1.

Since claims 2, 3, and 6 depend on claim 1, they include the feature of "logic associating one or more frequencies of light to one or more temperatures of said resonator," and are also not anticipated by Huber. Similarly, independent claim 7 recites a process involving identifying a frequency stored in a logic device, and identifying a temperature associated with that frequency in the logic device. Therefore, for at least the same reasons given above in relation to claim 1, Huber does not necessarily function in accordance with the limitations of claim 7, and therefore does not anticipate claim 7.

Claims 1, 3-4 and 6-7 were rejected under 35 U.S.C. § 102(b) for anticipation by Ueda (U.S. 6,498,878). The Applicant respectfully traverses this rejection.

Ueda relates to a waveguide grating. The waveguide grating consists of an underlying clad 31, waveguides 14, and upper clad 33, deposited on a substrate 11. A heater 22 forms a zigzag pattern on upper clad 33. Col. 3, lines 39-49. The temperature of the waveguides is kept constant, thereby keeping the difference in lengths among the waveguides constant, which keeps the center wavelength of the output waveguides constant. Col. 4, lines 33-41.

The Office Action states that the waveguide grating 14 of Ueda is a resonator. The Applicant respectfully traverses this contention. The temperature control in Ueda is directed to maintaining the difference in length of the waveguides so that the output of the center waveguide remains constant. In the present application, the temperature of the resonator directly affects the refractive index of the resonator, thereby determining the frequency selected by the circuit. Consequently, the waveguides of Ueda are not resonators, and do not anticipate claim 1 of the application. The Applicant further respectfully submits that claim 7, which recites a resonator, and claims 2-6, which depend on claim 1, are also distinguished over Ueda.

Furthermore, claims 1 and 7 recite that the photonic switch retrieves a temperature/frequency pair from a logic device, and sets the resonator at that temperature so as to precisely select the associated frequency. Ueda does not disclose such a precise frequency selection scheme. Specifically, Ueda does not disclose a processor or memory that is used to precisely select a frequency like that which is disclosed in the present invention. Also, Ueda discloses a process of maintaining the temperature of a waveguide constant, so as the center wavelength of output wave guides are kept constant. Ueda is not concerned with selecting temperature frequency pairs in order to select a precise frequency in a photonic circuit. Consequently, claims 1 and 7, and their associated dependent claims, are patentable over Ueda.

The Office Action further states in relation to Ueda that "in order for the system [of Ueda] to associate a measured temperature with a desired temperature (which would cause the arrayed grating to perform the multiplexing/demultiplexing according to a designed protocol), it is inherent that some kind of logic is used (e.g., in the simplest form whether a measured temperature is equal or not to a set temperature)." For at least the same reasons outlined above in connection with the Huber reference, Ueda does not necessarily function or contain all the claim limitations of claim 1 or claim 7, and therefore cannot anticipate claim 1 or claim 7, or claims 3, 4, or 6 that are dependent on claim 1.

Claims 1, 3, 6-8 and 10-11 were rejected under 35 U.S.C. § 102(b) for anticipation by Eggleton (U.S. 6,438,277). The Applicant respectfully traverses this rejection.

Eggleton relates to a thermally tunable optical device 9 that has an optical waveguide 10, thermally sensitive optical element 11, electrical resistance heater 12, current source 13, and a control circuit 14. The control circuit 14 has a microprocessor controller 15 and a resistance detector 16. The resistor detector 16 is coupled to the heater 12, and the output of the detector 16 is supplied to the controller 15. (Col. 2, line 64 --- Col. 3, line 11). The signal from the detector 16 to the controller 15 is used to stabilize the device. (Col. 3, lines 37-38).

The present invention is not directed to stabilizing a device like Eggleton, but rather, is directed to precisely controlling a photonic switch by selecting temperature/frequency data from a logic device, and adjusting the temperature of the resonator to that temperature, thereby precisely controlling the frequency selected by the photonic circuit. Eggleton does not disclose such a precise temperature/frequency logic means to select a particular frequency. Moreover, the infinitely variable and precise control of the frequency selected by the present invention is not inherent in Eggleton. Indeed, Eggleton discloses only a conventional feedback loop to maintain the stability of the device (Col. 4, lines. 10-15), not extensive temperature/frequency logic to operate as an infinitely variable switch. Also, Eggleton discloses only a single control signal to the microprocessor 15 (to ***stabilize*** the circuit against ***ambient*** changes, Col. 2, line 35), not extensive temperature and frequency logic to infinitely and variably select a frequency as disclosed by the present invention.

The Office Action further states in connection with Eggleton that "in order for the system [of Eggleton] to associate a measured temperature with a desired temperature (which would cause the grating to transmit or reflect the desired wavelength), it is inherent that some kind of logic is used (e.g., in the simplest form whether a measured temperature is equal or not to a set temperature)." For at least the same reasons outlined above in connection with the Huber reference, Eggleton does not necessarily function or contain all the claim limitations of claim 1 or claim 7, and therefore cannot anticipate claim 1 or claim 7. Since claims 3, 6, 8, 10 and 11 depend on claim 1 or claim 7, Eggleton does not anticipate those claims either.

§103 Rejection of the Claims

Claims 5 and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Huber (U.S. 5,159,601) in view of Koizumi (U.S. 5,696,543). Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Huber (U.S. 5,159,601) in view of Schwindt (U.S. 6,720,782). The Applicant respectfully traverses this rejection.

In connection with these obviousness rejections, the Office Action states that Huber discloses all the limitations of claims 5 and 9 except for specifying that the metal wire of the sensor is aluminum, and that Huber discloses all the limitations of claim 12 except for specifying that during the measurement of the resistance of the wire, the value of the voltage is taken by using a voltmeter connected to the wire via a Kelvin connection. The Applicant respectfully submits that as shown above, Huber does not disclose "logic associating one or more frequencies of light to one or more temperatures of said resonator." Consequently, the Office Action has failed to establish a prima facie case of obviousness, and the Applicant respectfully requests the withdrawal of these rejections.

Office Action's Response to Applicant's Arguments

The Office Action asserts that it would be impossible for the devices of either Huber or Ueda to operate without any type of processing means as well as a type of data storage to compare a measured value against a desired set of values. The Applicant respectfully disagrees with this contention.

Huber relates to adjusting a laser so that the selected wavelength remains in the laser's gain bandwidth by adjusting the dimensions of a grating with a heating element. Col. 1, lines 40-44; Abstract. This control is accomplished through the use of a hard-wired circuit including a thermistor 26 and a difference amplifier 28. Col. 2, lines 57-61. Therefore, contrary to the assertion of the Office Action, the device of Huber can and does operate without processing means and a type of data storage.

Similar, in Ueda, the temperature of the waveguides 14 is kept constant by means of a feedback circuit. Col. 4, lines 34-37. Ueda does not disclose such a circuit, but the Applicant respectfully submits that such a circuit could be hard-wired, without a processor or memory, such as in Huber.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at 703-367-2128 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

THOMAS J. MCINTYRE ET AL.

By their Representative,

MARK A. WURM
6600 Ladyslipper Lane
Clifton, Virginia 20124
703-867-8334

Date July 18, 2005 By Mark A Wurm
Mark A. Wurm
Reg. No. 31,682

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop AF, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 18th day of July, 2005.

Mark A. Wurm — Mark A Wurm

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